9/14/00

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of Koji Nakamura, Fumiko Osumi and Hidetsugu Matsushita For: SYSTEM FOR SPECTROMETRY	**Attorney Docket No.** **8042.102US0**

San Francisco, California

Box Patent Application
Assistant Commissioner for Patents
Washington, D.C. 20231

By Express Mail No: EL627004550US
Dated: September 13, 2000

PATENT APPLICATION TRANSMITTAL

Sir:

Transmitted herewith for filing is the patent application of inventors KOJI NAKAMURA, FUMIKO OSUMI and HIDETSUGU MATSUSHITA, for "SYSTEM FOR SPECTROMETRY." Enclosed are:

1. Fifteen (15) pages of the specification, including six (6) claims and an abstract.

2. Five (5) sheets of drawings.

3. A DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION of the inventors.

4. An ASSIGNMENT of the invention to SHIMADZU CORPORATION, Form PTO-1595, and a check to cover the $40.00 fee.

5. Certified copy of Japanese Appln. 11-369177, filed December 27, 1999, upon which this application claims priority.

6. Please send all correspondence related to this application to Keiichi Nishimura, Reg. No. 29,093, at:

Majestic, Parsons, Siebert & Hsue P.C.
Four Embarcadero Center, Suite 1100
San Francisco, California 94111-4106
Telephone: (415) 248-5500
Facsimile: (415) 362-5418

The filing fee is calculated to be $690.00, a check for which is enclosed. The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment, to Deposit Account No. 13-1030. This authorization is provided in duplicate.

Dated: September 13, 2000.

Keiichi Nishimura (Reg. No. 29,093)
MAJESTIC, PARSONS, SIEBERT & HSUE P.C.
Four Embarcadero Center, Suite 1100
San Francisco, California 94111-4106
Telephone: (415) 248-5500
Facsimile: (415) 362-5418

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION FOR PATENT

SYSTEM FOR SPECTROMETRY

Inventors: Koji Nakamura
Fumiko Osumi
Hidetsugu Matsushita

Background of the Invention

This invention relates to a system for spectrometry which includes a spectrophotometer and in particular to a control unit for processing the data obtained by the spectrophotometer.

Many of the currently used systems for spectrometry comprise a spectrophotometer and a control unit which are provided as two separate components. The spectrophotometer is a hardware instrument for spectrophotometry and includes a light source, a spectroscope, a sample stage (or a sample holder) and a photo-detector. The control unit is for controlling the operation of the spectrophotometer and processing output signals from the spectrophotometer. The recent trend is to form a control unit with a variety of functions by running control programs for spectrometry on a multi-purpose personal computer.

The functions of such a control unit include the following. Before a measurement, a user interface is provided through which the user is required to select and set parameters related to the measurement such as the wavelength and the method of measurement (such as the point measurement and the scan measurement) and signals corresponding to such parameters are transmitted to the spectrophotometer. During the measurement, the control unit controls the operations of the individual parts of the spectrophotometer according to a specified time schedule, collects the output signals from the spectrophotometer and stores in a memory device data obtained therefrom. After the measurement,

the data obtained by the measurement are processed in order to calculate the transmissivity and the absorptivity of the sample and the results of such calculations are outputted through an output device such as a display or a printer.

A system for spectrometry can be used not only for investigating the absorption characteristics of a sample in analytical chemistry but also in a variety of other fields. In the production of optical filters, for example, it is necessary to measure the transmissivity of the produced filters to check whether they indeed have the predetermined value or below and a system for spectrometry can be used for such a test. In a research in biochemistry, as another example, a system for spectrometry may be used for measuring the concentration of a specified component. If the absorptivity of a certain sample is known at wavelengths 260nm and 230nm, for example, the concentrations of nucleic acids (such as DNA and RNA) and protein contained in the sample can be obtained by carrying out a certain calculation using these values.

Prior art control units of a system for spectrometry have the function of outputting the transmissivity and absorptivity at a specified target wavelength to an output device but are not provided with the function of carrying out calculations or making judgments by using values of transmissivity or absorptivity. In order to carry out such calculations or to make judgments, therefore, the user had to himself/herself carry out calculations or make judgments on the basis of the results of measurements outputted to the output device or to prepare a program for processing the results of measurements and to carry out the troublesome task of transferring the data on the results of measurements from the control program for spectrometry to this prepared program.

Summary of the Invention

It is therefore an object of this invention, in view of the problem described above, to provide an improved system for spectrometry having the

function of carrying out calculations by using measured values such as transmissivity and absorptivity obtained as a result of spectrometry.

It is also an object of this invention to provide a method for spectrometry having such function.

A system for spectrometry embodying this invention, with which the above and other objects can be accomplished, may be characterized not only as comprising an input device, a measuring device with a spectrophotometer to obtain measured values, a calculating device and an output device for outputting results of calculations by the calculating device but also wherein the input device allows a user to input target wavelengths at which spectrometric measurements are to be carried out, character arrays representing variables assigned to measured values which are to be stored, and character arrays representing calculation formulas created according to specified rules and the calculating device analyzes the character arrays representing the calculating formulas and carries out calculations of the calculating formulas by replacing any of the character arrays representing the variables, if contained in the calculating formulas, each by corresponding one of the measured values.

A control unit having various functions for spectrometry for such a system according to this invention may be formed, for example, by installing a multi-purpose operating system (OS) into a personal computer equipped with an input device (such as a keyboard or a mouse), a display device (such as a CRT or an LCD), a central processing unit (CPU) and memory devices (such as ROM, RAM and HDD) and running a specified program on this operating system. This control unit serves to display formula-generating screens (such as the screens for generating calculation formulas and judgment formulas) on the display device when the user carries out a certain operation on the input device. It is on such screens that the user inputs through the input device not only the target wavelength at which spectrometry is to be carried out but also the names of the variables where measured values (say, of absorptivity and transmissivity) at this target wavelength are to be stored. In addition, the user generates formulas for

calculations from the input device according to certain rules and registers these formulas in the system. In general, the formulas (or expressions) for calculations are formed by using elements including calculation operators (arithmetic operators +, -, * and /), comparison operators (>, <, =, etc.), logical operators (&, |, !=, AND, OR, NOT, etc.), character arrays indicating constants and variables defined by the user, character arrays representing constants and variables installed in the system, and numerical values expressed by Arabic numerals.

After a target wavelength, variable names and operation expressions are inputted, the user sets a sample at a specified position in the system and inputs an execute command for starting spectrometry. When this command is received, the system carries out the measurement of the sample by means of the spectrophotometer of its measuring device and obtains measured values at the specified target wavelength. After the measured values are obtained, the calculating means of the system carries out calculations by analyzing the earlier inputted character arrays in the operation expressions. In this operation, the calculations are done by replacing the variable names contained in the character arrays of the operation expressions by measured values which have been obtained. After a result of calculation is obtained, the output means of the system outputs it in a form recognizable by the user.

Brief Description of the Drawings

The accompanying drawings, which are incorporated in and form a part of this specification, illustrate an embodiment of the invention and, together with the description, serve to explain the principles of the invention. In the drawings:

Fig. 1 is a schematic block diagram of a system embodying this invention for spectrometry;

Fig. 2 is a wavelength setting screen displayed on the output device in the system of Fig. 1;

Fig. 3 is a calculation formula preparing screen displayed on the output device;

Fig. 4 is a constant registering screen displayed on the output device;

Fig. 5 is a table displaying the results of measurements and calculations;

Fig. 6 is a judgment formula preparing screen displayed on the output device; and

Fig. 7 is a table displaying the results of measurements and judgments.

Detailed Description of the Invention

The invention is described next by way of an example with reference to Figs. 1-7. As shown in Fig. 1, a system 1 for spectrometry according to this invention is comprised not only of a spectrophotometer 2 of a known kind but also a personal computer including an input device 3 (such as a keyboard or a mouse), an output device 4 (such as a CRT or an LCD), a central processing unit (CPU) 5 and memory devices 6 (such as ROM, RAM and HDD). The personal computer has an operating system with an graphical user interface installed and has a specified program run on the operating system so as to serve as a control unit with various functions for spectrometry.

The invention is described next for the case of spectrometrically measuring the concentrations of nucleic acid and protein (respectively C_n and C_p) contained in a given sample. Since C_n and C_p (in units of mg/l) are known to be given by the following formulas:

$$C_n = k_1A_1 - k_2A_2 \quad (1)$$

$$C_p = k_3A_2 - k_4A_1 \quad (2)$$

where A_1 and A_2 are respectively the absorptivity of the sample at wavelengths 260nm and 230nm (with the background absorptivity subtracted), $k_1 = 49.1$, $k_2 = 3.48$, $k_3 = 183.0$ and $k_4 = 75.8$, spectrometric measurements are carried out at

wavelengths 230nm and 260nm at which absorptivity is to be determined, as well as at the wavelength (such as 320nm) at which the background absorptivity is to be determined.

As the user operates the input device 3 in a specified manner to start up a program for spectrometry, a main screen (not shown) is displayed on the output device 4. The main screen includes command buttons and menus allowing the user to click thereon to make use of various functions of the system.

Fig. 2 shows a wavelength setting screen 10 comprising a drop-down list 11 for selecting the method of measurement, two text boxes 12 and 13 for entering the wavelengths at which measurements (say, of absorptivity) are to be taken and the variable name given to the measured value, a radio button 14 for selecting the method of obtaining data, three command buttons (ADD, DELETE and CLOSE) 15-17 and a list box 18 with three fields (wavelength, variable name and measurement method). On the wavelength setting screen 10, the user selects the method of measurement (such as the point method or the scan method) through the drop-down list 11 and enters the value of a desired wavelength (in units of nm) and a variable name respectively in the text boxes 12 and 13. If the ADD button 15 is clicked thereafter, these inputted data are registered in the system and also added into the list box 18. If there are data which have become unnecessary or if an incorrect data entry has been made, these items may be selected in the list box 18 and the DELETE button 16 clicked in order to remove these data from the system and from the list box 18. Fig. 2 shows that wavelengths 230nm and 260nm have been selected for the measurement of absorptivity, that variable names "WL230" and "WL260" have correspondingly been registered in the system and that wavelength 320nm has been set under the name "WL320" for the measurement of background absorptivity. The radio button 14 is used for selecting whether the spectrophotometer 2 is used to obtain absorptivity (DEVICE) or it is done manually by the user (MANUAL). After the setting is all completed, the user clicks the CLOSE button 17 to close the wavelength setting screen 10.

Fig. 3 shows a calculation formula preparing screen 20 for allowing the user to prepare various operation expressions (or formulas) by using the variables registered in the system, constants, formulas, functions and operators. In the upper section of the calculation formula preparing screen 20 are text boxes 21, 22 and 23 respectively for entering a name for the formula to be prepared, the unit for the value obtained by the formula and a character array representing the formula itself. A CLEAR button 24 is for clearing the contents of the text box 23. In the middle portion of the calculation formula preparing screen 20 are two list boxes 25 and 26 for giving support to the input of formulas into the text box 23, as well as a command button (CONSTANT) 27. The list box 25 on the left-hand side lists the names of variables, constants and formulas which have been registered in the system. If any of these entries is double-clicked by the mouse, the corresponding name is inserted at the current position of the curser in the text box 23. The list box 26 on the right-hand side is for displaying the operators which may be utilized in the formulas. If any of these operators is double-clicked by the mouse, the double-clicked operator is inserted into the text box 23 at the current position of the cursor.

If the CONSTANT button 27 is clicked, a constant registering screen 40 as shown in Fig. 4 is displayed on the output device 4 for allowing the user to assign names to constants (or coefficients) to be used in the calculation and to register these assigned names. If the user enters a name of a constant and its value respectively into the test boxes 41 and 42 in the upper part of the screen and clicks an ADD button 43, the name and the value of this constant thus entered are registered in the system. If any of the constants already registered and displayed in another list box 44 is selected and a DELETE button 45 is clicked, the selected constant is deleted from the system. Fig. 4 shows the list box 44 showing that the four constants (coefficients) contained in (1) and (2) are registered under the names of k1, k2, k3 and k4. The names of the constants registered through the constant registering screen 40 are displayed in the left-hand list box 25 of the calculation formula preparing screen 20. After the

necessary constants are all registered, the user clicks on a CLOSE button 46 to close the constant registering screen 40.

With reference to Fig. 3 again, the lower part of the calculation formula preparing screen 20 includes a list box 28 for displaying the names and the contents of the formulas registered in the system, as well as four command buttons (ADD, DELETE, CLOSE and SAVE) 29-32. If the user clicks on the ADD button 29 after a operation formula is prepared as explained above, its name and content are registered in the system and these data are added in the list box 28. The entry corresponding to any of the formulas in the list box 28 can be deleted if it is selected in the list box 28 and the DELETE button 30 is clicked. The formula names registered in the system are displayed not only in this list box 28 but also in the list box 25 in the middle part of the screen 20. Fig. 3 shows that the formulas for calculating the absorptivity (values after the background absorptivity has been corrected) at wavelengths 230nm and 260nm are registered respectively under the names of "corr230" and "corr260", the formula for calculating the ratio between the two absorptivity values under the name of "260_230_ratio", the formula for calculating the concentration of nucleic acid under the name of "DNA-equ1", and the formula for calculating the concentration of protein under the name of "Protein". After all formulas have been prepared, the user clicks on the CLOSE button 31 to close the calculation formula preparing screen 20. If the SAVE button 32 is clicked before the calculation formula preparing screen 20 is closed, the data related to the formulas which have been prepared are saved in the memory device 6 in the form of a file.

Spectrometric operations are carried out if the user carries out a certain specified operation on the input device 3 (such as clicking a MEASURE button appearing on the main screen (not shown)) after the formulas have been prepared as described above. After the spectrometric measurements are completed, the system calculates absorptivity at each of the wavelengths 230nm, 260nm and 320nm from the signals received from the spectrophotometer 2 and stores these values in correlation with the three variables "WL230", "WL260"

and "WL320". Next, the system analyzes the formulas which have been registered and carries out the calculations represented by them. If any of the variables described above is encountered in this process, the system replaces it with the corresponding absorptivity value to carry out the calculations. After the calculations are completed, the obtained values are stored in correlation with the corresponding formula names. If the name of another formula appears in the analysis of a formula, the calculation is carried out by replacing the formula name by the corresponding value.

After the calculations are all done, the system displays a table 47 as shown in Fig. 5 for showing together the results of the measurement and the results of the calculations. For preparing this table 47, the system forms a field (a column) corresponding to each of the registered variables and formulas. When measurements are made on a plurality of samples under the same conditions, the system adds a data row for each sample. If the output device 4 includes a printer, the table 47 can be printed out by clicking a PRINT button 48. If a SAVE button 49 is clicked, the data displayed in the table 47 are stored in the memory device 6.

Fig. 6 shows a judgment formula preparing screen 50 which is structured conveniently for creating a judgement formula for the measured values obtained by the spectrometric measurement, including list boxes 56, 57 and 59, and command buttons (CONSTANT, ADD, DELETE, CLOSE and SAVE) 58 and 60-63 are structured and function similarly to the list boxes 25, 26 and 28 and the command buttons 27 and 29-32 on the calculation formula preparing screen 20 except operators used for comparisons, judgment making and logical operations, rather than arithmetic operators, are displayed in the list box 57.

Consider an application, as an example, wherein the system is used in a spectrometric quality check of ultraviolet filters which have been manufactured. Let us assume that the transmissivity at wavelength 254nm (T1) of the filters is desired to be less than 1.0% and that at wavelength 405nm (T2) to be less than 0.1%. For carrying out a check on the filters, the transmissivity values T1 and T2 for each are measured spectrometrically and only those of the

checked filters for which the logical calculation according to the formula given below has TRUE as its result may be considered acceptable:

$$(T1<1.0)\&(T2<0.1) \quad (3)$$

where the ampersand indicates the logical product (AND).

A judgment formula for carrying out such judgment may be prepared, for example, as follows. The user will first register in the system the settings related to measurements at wavelengths 254nm and 405nm under the variable names respectively of "WL254" and "WL405" by using the wavelength setting screen 10. These variable names are then displayed in the list box 56 of the judgment formula preparing screen 50, on which the user enters an arbitrary formula name indicative of the judgment formula in the text box 51. Next, the user uses the variable names and the operators displayed in the list boxes 56 and 57 to input the following judgment formula in the text box 54:

$$(WL254<1.0)\&(WL405<0.1) \quad (4)$$

Any character array indicative of "pass" is inputted to the text box ("pass text") 52 and another character array indicative of "fail" is inputted to the text box ("fail text") 53. Thereafter, the user clicks the ADD button 60 to register the judgment formula "PF_1". Fig. 6 shows character arrays "Pass" and "Fail" having been set.

After the judgment formula has thus been created, the user operates the input device 3 in a specified manner to carry out a spectrometric measurement process. After intended spectrometric measurements have been completed, the system obtains transmissivity values at the selected wavelengths (254nm and 405nm) on the basis of the signals received from the spectrophotometer 2 and stores them in correlation with the two variables "WL254" and "WL405". Next, the system analyzes the registered judgment formula "PF_1" and judges whether its value comes out to be TRUE or FALSE. If either of these variables appears in the judgment formula during this process, the system carries out the calculation by substituting the variable with the transmissivity value correlated to this variable. The value obtained by the

judgment formula is then stored in correlation with the name "PF_1" of the judgment formula.

After a judgment is made, the system displays the result of the measurement and the result of the judgment in a table 65 as shown in Fig. 7. In forming this table 65, the system prepares a field (column) for each of the variables and formulas which have been registered. If measurements are taken on a plurality of samples under the same conditions, the system serves to add a new data row every time a new sample is measured. Fig. 7 shows an example wherein the results of checking on two filters (sample ID = 1 and 2) are displayed. For the filter with sample ID = 1, the value of variable WL254 exceeds 1.0 and the value of (4) becomes FALSE and hence the value of "PF_1" becomes "Fail". As for the other filter with sample ID = 2, the value of (4) becomes TRUE and hence the value of "PF_1" is "Pass".

Although the invention has been described above with reference to only one example but this example is not intended to limit the scope of the invention. Many modifications and variations are possible within the scope of this invention. For example, although an example has been shown wherein calculation and judgment formula preparing screens are separately created, this is not a necessary requirement. The program may be so designed as to define a function of a kind for making judgment commonly used for table calculation software and to use such a function in the text box 23 of the calculation formula preparing screen 20. such that a judgment formula can also be created on the calculation formula preparing screen 20.

As explained above, a system embodying this invention is characterized as being capable of creating various formulas, whenever necessary, such as a calculation formula and a judgment formula using values obtained spectrometrically by the user, thereby obviating the necessity of cumbersome procedures of the prior art technology whereby the user himself/herself had to carry out calculations based on measured data and to make judgments based

thereupon, or to transmit measured data into a separate software program for carrying out such processing.

What is claimed is:

1. A system for spectrometry comprising:

an input device for allowing a user to input target wavelengths at which spectrometric measurements are carried out, character arrays representing variables assigned to measured values, and character arrays representing calculation formulas created according to specified rules;

a measuring device for spectrometrically measuring a sample with a spectrophotometer to thereby obtain measured values at said target wavelengths;

a calculating device for analyzing the character arrays representing said calculating formulas and carrying out calculations of said calculating formulas by replacing any of the character arrays representing said variables, if contained in said calculating formulas, each by corresponding one of said measured values; and

an output device for outputting results of said calculations.

2. The system of claim 1 further comprising a memory device for storing said measured values in correlation with the character arrays representing said variables.

3. The system of claim 1 wherein said output device further serves to output the character arrays representing said variables.

4. The system of claim 1 wherein said input device further allows the user to input character arrays representing said measured values and a character array representing a judgment formula which includes the character arrays representing said measured values, wherein said calculating device further obtains a judgment result by using said judgment formula by replacing any of the character arrays representing said measured values, if contained in said judgment

formula, each by corresponding one of said measured values, and wherein said output device further outputs said judgment result.

5. The system of claim 4 wherein said judgment formula further includes logical operators.

6. The system of claim 1 which includes a personal computer serving as said input device, said calculating device and said output device.

Abstract of the Invention

A system for spectrometry includes an input device, a measuring device with a spectrophotometer, a calculating device and an output device for outputting results of calculations by the calculating device. The input device allows a user to input target wavelengths at which spectrometric measurements are to be carried out, character arrays representing variables assigned to measured values which are to be stored, and character arrays representing calculation formulas created according to specified rules. The measuring device serves to measure a sample spectrometrically with the spectrophotometer to obtain measured values at the inputted target wavelengths. The calculating device analyzes the character arrays representing the calculating formulas and carries out calculations of the calculating formulas by replacing any of the character arrays representing the variables, if contained in the calculating formulas, each by corresponding one of the measured values.

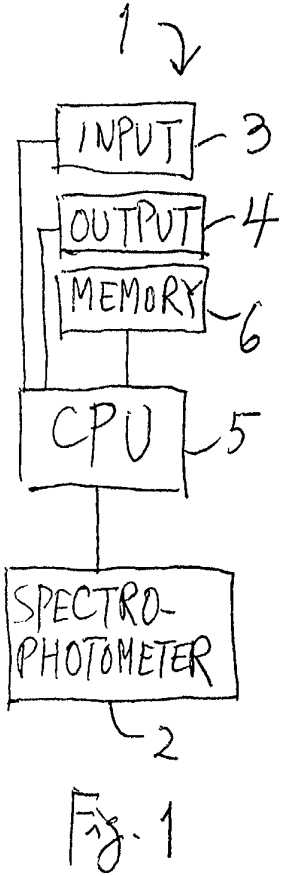


Fig. 1

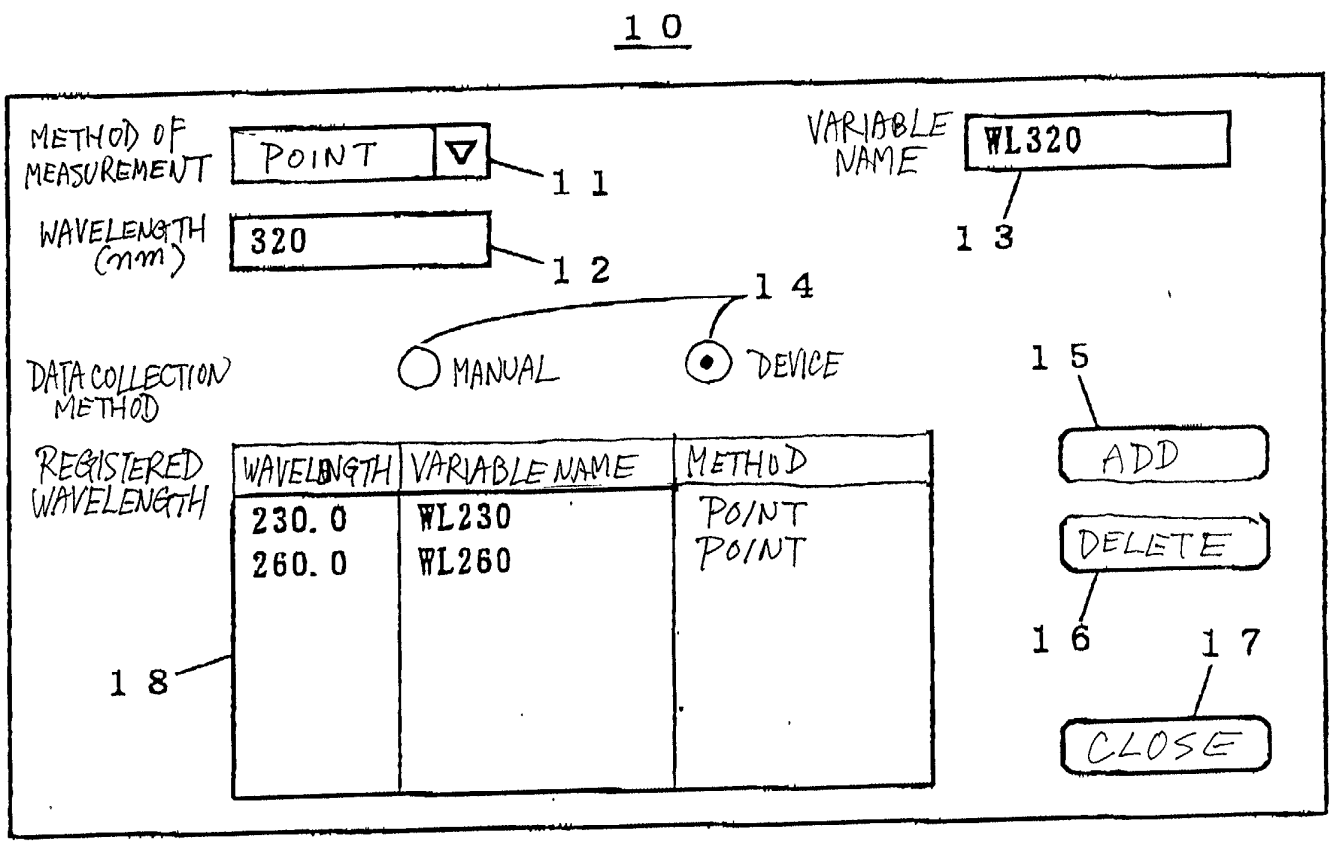


Fig. 2

20

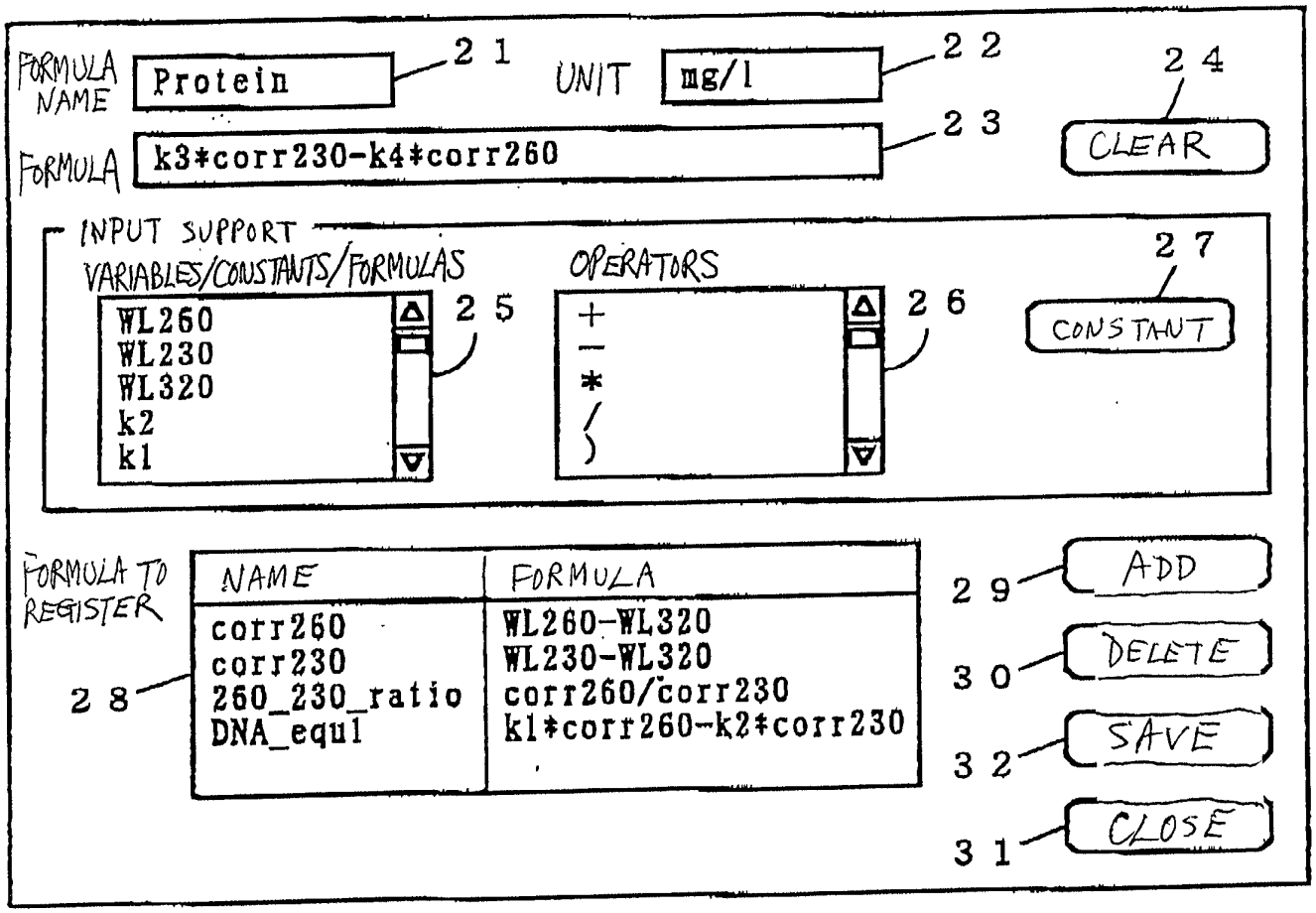


Fig. 3

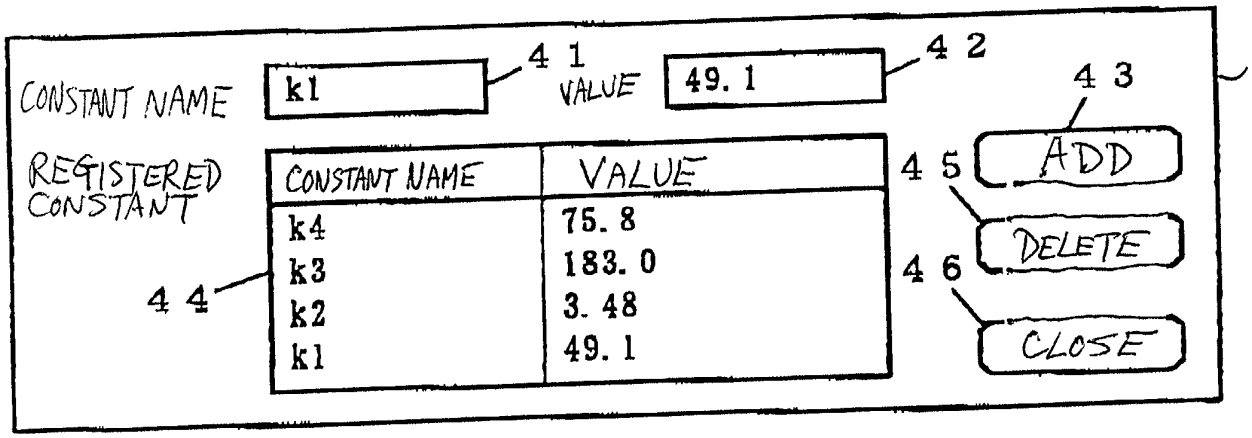
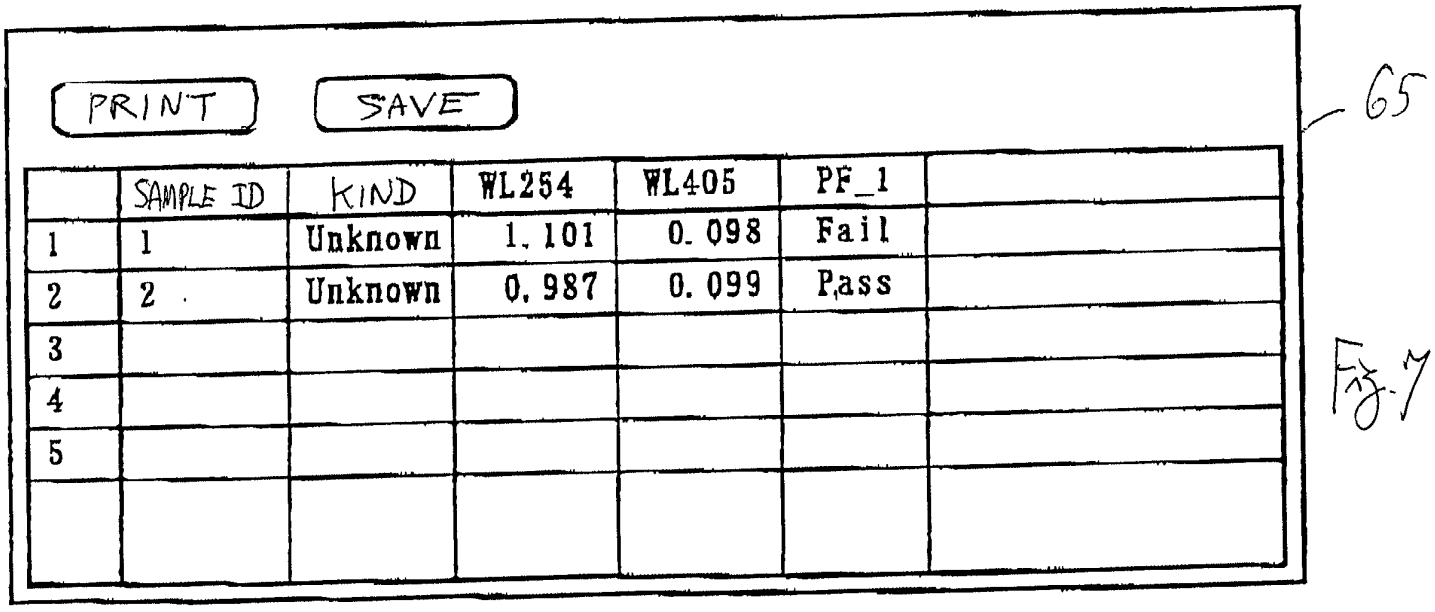


Fig. 4



	SAMPLE ID	KIND	WL254	WL405	PF_1	
1	1	Unknown	1.101	0.098	Fail	
2	2	Unknown	0.987	0.099	Pass	
3						
4						
5						

Fig. 7

47

48 PRINT

49 SAVE

	SAMPLE ID	KIND	WL260	WL230	WL320	corr260	corr230	260_230_ratio	DNA_equl	Protein
1	1	Unknown	0.270	0.503	0.002	0.268	0.501	0.534	11.401 mg/l	71.373 mg/l
2	2	Unknown	0.261	0.593	0.001	0.260	0.592	0.440	10.708 mg/l	88.537 mg/l
3	3									
4										
5										

Fig.5

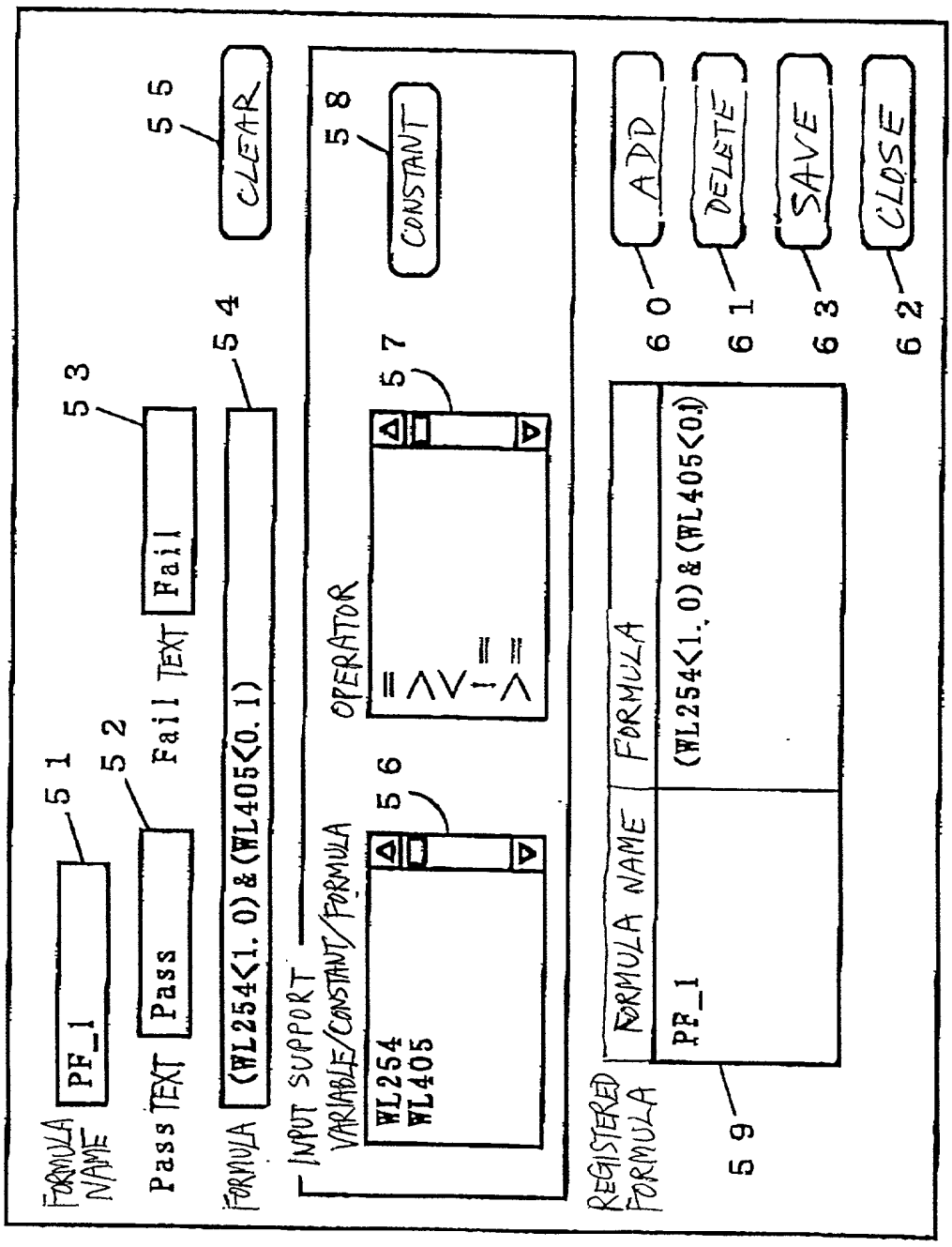

50
FORMULA NAME
PF_1
51
Pass TEXT
Pass
52
Fail TEXT
Fail
53
FORMULA
(WL254<1.0)&(WL405<0.1)
54
CLEAR
55
INPUT SUPPORT
VARIABLE/CONSTANT/FORMULA
WL254
WL405
56
OPERATOR
=
>
<
>=
<=
!=
57
CONSTANT
58
ADD
60
DELETE
61
SAVE
63
CLOSE
62
REGISTERED FORMULA
FORMULA NAME
FORMULA
PF_1
(WL254<1.0)&(WL405<0.1)
59

Fig. 6

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below-named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled SYSTEM FOR SPECTROMETRY, the specification of which

(check one)

[X] is attached hereto.

[ ] was filed on _____ as Application Serial No. _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge my duty to disclose to the office all information known to me to be material to patentability of this application, in accordance with Title 37, Code of Federal Regulations, §1.56, which is defined on the attached page.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed	
11-369177 (Number)	Japan (Country)	27 December 1999 (Day/Month/Year Filed)	[X] Yes	[ ] No
_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	[ ] Yes	[ ] No
_____ (Number)	_____ (Country)	_____ (Day/Month/Year Filed)	[ ] Yes	[ ] No

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulation, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	Filing Date)	(Status) (patented, pending, abandoned)
(Application Serial No.)	Filing Date)	(Status) (patented, pending, abandoned)
(Application Serial No.)	Filing Date)	(Status) (patented, pending, abandoned)

I hereby appoint the following attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: Gerald P. Parsons, Reg. No. 24,486; Martin F. Majestic, Reg. No. 25,695; J. Suzanne Siebert, Reg. No. 28,758; James S. Hsue, Reg. No. 29,545; Alison de Runtz, Reg. No. 37,119; Keiichi Nishimura, Reg. No. 29,093; _____ _____ _____; provided that if any one of said attorneys ceases being affiliated with the law firm of Majestic, Parsons, Siebert & Hsue P.C. as partner, employee or of counsel, such attorney's appointment as attorney and all powers derived therefrom shall terminate on the date such attorney ceases being so affiliated.

Direct all telephone calls to **KEIICHI NISHIMURA** at (415) 248-5500.

Address all correspondence to:

Customer No.: 

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Title 18, United

States Code, §1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor: Koji Nakamura

Inventor's signature: Koji Nakamura

Date: 7 / September, 2000

Residence: Kyoto, Japan

Citizenship: Japan

Post Office Address: 4-5-10-402 Ooe Nishishinbayashi-cho,
Nishikyo-ku, Kyoto 610-1141, Japan

Full name of second joint inventor, if any: Fumiko Osumi

Inventor's signature: Fumiko Osumi

Date: 7 / September, 2000

Residence: Kyoto, Japan

Citizenship: Japan

Post Office Address: 35-1-412 Saiin Higashiimada-cho
Ukyo-ku, Kyoto 615-0002, Japan

Full name of third joint inventor, if any: Hidetsugu Matsushita

Inventor's signature: Hidetsugu Matsushita

Date: 7 / September, 2000

Residence: Kyoto, Japan

Citizenship: Japan

Post Office Address: 41-1-111 Nishinoyama Kakenoue-cho
Yamashina-ku, Kyoto 607-8302, Japan

Section 1.56 Duty to Disclose Information Material to Patentability.

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclose information exists with respect to each pending claim until the claim is cancelled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is cancelled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§ 1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

(1) prior art cited in search reports of a foreign patent office in a counterpart application, and

(2) the closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

(b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and

(1) It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim; or

(2) It refutes, or is inconsistent with, a position the applicant takes in:

(i) Opposing an argument of unpatentability relied on by the Office, or

(ii) Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

(c) Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:

(1) Each inventor named in the application;

(2) Each attorney or agent who prepares or prosecutes the application; and

(3) Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.

(d) Individuals other than the attorney, agent or inventor may comply with this section by disclosing information to the attorney, agent, or inventor.